



## Analysis of Tissue Coagulation Region Generated by Microwave Surgical Device

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In modern surgery, surgical devices having multiple functions (ex. tissue coagulation and tissue resection) are frequently used. These devices contribute to shortening the operation time and suppressing the amount of bleeding. However, it is reported that thermal damage caused by surgical device occurs not only to the target site but also to the surrounding tissue. Since thermal damage of neighboring organs may cause postoperative pain and serious complications, it is necessary to evaluate the heating characteristic of the surrounding tissues of the device. Particularly, microwave surgical device is a new device, and there are insufficient survey data compared with conventional surgical devices (ex. electrical scalpel). Therefore, evaluation of coagulated region of microwave surgical device is required. However, evaluating experimented result using animal prove to be difficult. We calculated coagulated region using numerical analysis. When calculating it, we considered the relationship between the temperature and the coagulation time. Generally, biological tissue coagulates at approximately 60 °C or higher. However, when the heating time is long, the biological tissue coagulates even if it is less than 60 °C. To determine coagulated region, it is necessary to consider the relationship between temperature and heating time. Then, to confirm the validity of numerical analysis, we compared the numerical analysis with the *ex-vivo* experiment. As the result, numerical analysis and experiments showed that similar coagulated region. These results showed the validity of the numerical analysis. In this study, coagulated region was calculated by numerical analysis and the validity was confirmed by experiment. This is an important indicator for evaluating the influence on surrounding tissues more than the SAR (Specific Absorption Rate) and the temperature distribution.